# On hybrids of Batocera albofasciata and gigas

by

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(With pl. 13 and 14).

While studying the economic significance of a number of Cerambycids, which live in the isle of Java in the Indian rubbertree, *Ficus elastica* [1]), some deviating forms of *Batocera's* had fallen into the hands of the author. These had partly been caught in the field, partly been reared on Ficus-wood.

These deviations generally much resemble the *Batocera gigas* DRAP., but have, like *Batocera albofasciata* DE GEER, a number of white spots [2]) on the elytra, generally two, sometimes even three or four. As both above-mentioned *Batocera*-species in breeding had never yielded such deviations it was evident, that these might be hybrids between the two species, which often occur side by side in Ficus-plantations.

In order to solve this problem, experiments of cross-breeding have been made between the two species of *Batocera's*.

Before communicating the results of these experiments, something may be said here about the breeding itself of these beetles.

Taken on the whole the breeding of such large Cerambycids in tropical regions is not so difficult as in temperate zones; one generally obtains two, in favourable circumstances even three generations in a year, viz. two in the rainy season, from November till April, while the third generation remains

[1]) See DAMMERMAN, De boorders in Ficus elastica, Med. 7, Afd. voor Plantenziekten, Batavia 1913.

[2]) In life-time these patches are brimstone-coloured, only after death they become pure white.

as larva in the wood, during the whole dry season, to appear as beetle at the setting in of the western monsoon.

The offspring is also rather numerous. of the above mentioned *Batocera's* often more than 200 larvae might be got from one female; only, the breeding of such a large number of larvae of considerable size, — they reach a length up to 10 cM. —, requires a large quantity of newlycut Ficus-wood.

For every four or five larvae a piece of wood of 1 M. length and of an arm's or leg's thickness is required, if one wants to be certain that the larvae will develop into beetles. If one rears too many larvae in a piece of wood of limited length, the larger larvae will devour the smaller ones.

For the crossings individuals reared by myself were selected; of these the parents as well as the grandparents were known and which showed no deviations from the normal type.

As the *gigas* generally become much bigger than *albofasciata*, small individuals were selected for them, which in size agreed with *albofasciata*, in order to prevent that difference in size might be a hindrance to the cross-breeding.

The crosses succeeded very well, only the number of hybrids was very small, viz. 14 from the cross *albofasciata* ♂ × *gigas* ♀ and 15 from *gigas* ♂ × *albofasciata* ♀.

This small number of offspring, like the smaller size of the individuals and the occasional bad development, is probably only partly a consequence of hybridisation. Partly it is owing to insufficient feeding, as the larvae had to be reared on sawed-off Ficus-wood, which after some time desiccates of course.

At the cross *albofasciata* ♂ × *gigas* ♀ the eggs were laid between April 4 and July 20 1913, the beetles hatched between October 19 1913 and January 28 1914.

At the reciprocal cross the eggs were laid between November 17 1913 and January 14 1914 and the beetles hatched between March 26 and August 7 1914.

The hybrids show the following pecularities (See pl. 13 and 14):

They rather differ between themselves, as well as regards colour as design, on the whole the colour is intermediate, neither the pure brown of the *gigas* nor the pure grey of the *albofasciata*; as regards design the hybrids are strongly matrocline, so they are most like the mother.

From the cross *albofasciata* ♂ × *gigas* ♀ 6 of the 14 hybrids are unspotted, 3 show one row, 3 two rows and 2 four rows of spots; from the cross *gigas* ♂ × *albofasciata* ♀ only one specimen has two rows, 7 have three rows and 7 others have four rows of spots.

Besides the sex-ratio is remarkable. With both species the number of males and females is about the same, with the hybrids the males dominate greatly, in one case 11 ♂♂ on 3 ♀♀ and in the other case 11 ♂♂ on 4 ♀♀.

It has also been tried to cross the hybrids between themselves and hybrids with one of the species. The following cross-breedings were made (in the following table AG. means hybrid *albofasciata* ♂ × *gigas* ♀ etc.):

AG. ♂ × AG. ♀, the ♀ lived from October 20, 1913 till March 5, 1914.
AG. ♂ × A. ♀ » March 23, 1914 till July 24, 1914.
AG. ♂ × G. ♀, » May 3, 1914 till August 12, 1914.
GA. ♂ × A. ♀, » Juny 1, 1914 till September 9, 1914.
GA. ♂ × G. ♀, » March 30, 1914 till August 9, 1914.

In all these cases no offspring was obtained, so that one may consider the hybrids as being sterile.

I succeeded however in obtaining a few descendants from *gigas* ♂ and a female strongly resembling *gigas* with two white spots on the elytra, which was reared on Ficus-wood, but of which the parents were not known.

Of the five hybrids, which were obtained, 3 are unspotted, but two show besides the small maternal spots, a third spot.

Mr. FRED. MUIR from Honolulu saw these *Batocera's* on a visit to the isle of Java. He has been kind enough to examine the sexual organs of the males of both species as well as of the hybrids. On this subject he wrote to me the following:

"..... *gigas* has the "double ducts" or two openings for the ejaculatory ducts on the apex of the internal sac. The "apical armature" of the sac is membraneous without any

chitination. In all respects it is very similar to many of its allies. *Albofasciata* is the same in all details, the sac is the same length and the "armature" cannot be recognized from that of *gigas*. The hybrids are the same, as was to be expected".

From the obtained results one may deduce that the deviating forms which I had caught some time ago, as well as those reared by me, are actually hybrids of *albofasciata* and *gigas*. With the free-living species such hybrids are rarely found, norwithstanding the fact, that both species regularly occur side by side in great numbers. As long as the animals are free to select, they only mate with their own species, pairings between the two species will be very accidental.

The above described hybrids remind us strongly of another species, viz. *Batocera thomsoni* JAV.; this species much resembles the *gigas* but as a rule shows one row of white spots (the second row) while one or two other rows may occur besides.

It is however not probable that the *thomsoni* is a hybrid of *gigas* and *albofasciata*, as *thomsoni* occurs in the isles of Sumatra and Borneo, while the *gigas* is only found in the isle of Java.

Not much may be added to the afore-said cross-breedings: we can only guess at a possible explanation.

In connection with that, which FEDERLEY found with *Pygaera*-hybrids [1]), one may conceive, that the egg-cell principally develops parthenogenetically and the paternal nucleus can only partly influence it and is rejected for the greater part.

Not only would this explain the matrocline character of the hybrids, but also the difference in sex-ratio with the pure races and the hybrids. One often sees in parthenogenesis with insects, that the offspring is for the greater part of one sex.

Cytological investigation might throw some light upon this, but the sterility of the hybrids and the fact that these are very difficult to rear in greater numbers remain an obstacle to the further study.

Bussum, Febr. 1919.

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[1]) FEDERLEY, Das Verhalten der Chromosomen bei der Spermatogenese der Schmetterlinge *Pygaera anachoreta*, *curtula* und *pigra*, sowie einiger ihrer Bastarde. Zeitschr. für Ind. Abst. u. Vererbungslehre Bd. 9. 1913.